



DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

Technical Bulletin: Water Budget and Water Quantity Risk Assessment

Tier 2 Subwatershed Stress Assessment and Tier 3 Local Area Risk Assessment

Surface Water Drought Scenarios

Date: April 2010

Ontario Ministry of Natural Resources
Ontario Ministry of the Environment

The Clean Water Act requires Source Protection Committees (SPCs) to prepare an assessment report for each source protection area it represents, in accordance with the regulations, the Director's Technical Rules and the approved terms of reference for that source protection area.

As part of the assessment report, SPCs must identify four types of vulnerable areas within each source protection area. These include wellhead protection areas (WHPAs), intake protection zones (IPZs), highly vulnerable aquifers (HVAs), and significant groundwater recharge areas (SGRAs) for types I, II and III drinking water systems. The SPCs must also assess risks to water quality and quantity for these drinking water systems. The water quality and quantity risk assessments complete the assessment report.

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In order to evaluate the risks to water quantity, the SPC must evaluate the ability of the water supply to meet the community's drinking water needs following a tiered water budget analysis. This is called a stress assessment. This tiered approach uses water budget models in which the local water supply, water demands and the needs of the aquatic ecosystem will be compared through a process of successively more detailed and focused level of technical complexity, more refined information derived from water budgeting work and refined geographical scale. The water quantity risk assessment will also evaluate the potential hydrologic stress that could arise from future water needs and periods of drought.

The water budget and quantity risk assessment framework requires that drought scenarios must be considered beginning at Tier 2.

This technical bulletin provides clarification to Source Protection Committees on the process of evaluating the surface water drought scenarios in water budgets that are being developed for the water quantity assessments in order to assign Tier 2 subwatershed stress levels and Tier 3 exposure levels.

Definitions

"ten year drought period" means the continuous ten year period for which precipitation records exist with the lowest mean annual precipitation;

"two year drought period" means:

- (a) in relation to an assessment of surface water quantity, the continuous two year period for which precipitation records exist with the lowest mean annual precipitation, and
- (b) in relation to an assessment of groundwater quantity, a simulated two year period with no groundwater recharge;

Tier 2 Subwatershed Stress Assessment – Surface Water Drought

Technical Rule 34(2)(d)

- Rule 34(2)(d) in relationship to an **existing surface water system** specifies that scenarios D (existing system – two year drought) and E (existing system – future two year drought) as well as scenarios G (existing system – ten year drought) and H (existing system – future ten year drought) are separately evaluated to determine the surface water subwatershed stress level.

Technical Rule 34(2)(d) and Rule 34(2)(c)

- Rule 34(2)(d) further states that if the simulations of both scenarios D and G or both scenarios E and H results in either of the following circumstances in Rule 34(2)(c), then the stress level of the subwatershed should be assigned moderate.

Circumstance 1: any part of a surface water intake was not below the water's surface during normal operation of the intake, or

Circumstance 2: the operation of a surface water intake pump was terminated because of an insufficient quantity of water being supplied to the intake.

Technical Rule 34(2)(e)

- Rule 34(2)(e) in relationship to a **surface water planned system** specifies that scenarios D (existing system – two year drought) and E (existing system – future two year drought) or F (planned system – two year drought) as well as scenarios G (existing system – ten year drought) and H (existing system – future ten year drought) or I (planned system – ten year drought) are separately evaluated to determine the surface water subwatershed stress level.

Technical Rule 34(2)(e) and Rule 34(2)(c)

- Rule 34(2)(e) further states that if the simulations of both scenarios D and G or scenarios E and H or scenarios F and I results in either of the

following circumstances in Rule 34(2)(c), then the stress level of the subwatershed should be assigned moderate.

Circumstance 1: any part of a surface water intake was not below the water's surface during normal operation of the intake, or

Circumstance 2: the operation of a surface water intake pump was terminated because of an insufficient quantity of water being supplied to the intake.

Technical Rule 34(3)

- Rule 34(3) states that if a **stress level** was not assigned by any Scenario/Circumstance under sub-rule 34(1) and 34(2), then the stress level of the subwatershed would be assigned low.

If either scenario D or E or F (two year drought) do not result in either of the above circumstances at the intake, then scenario G or H or I (ten year drought) do not need to be simulated and the subwatershed stress level should be Low.

Clarification of the Technical Rule Requirements for Tier 2 Stress Assessment:

- If the two year drought scenario did result in a moderate stress level it would lead to further assessment using a ten year drought scenario.
- If the two-year drought scenario does result in a low stress, no additional analysis is required.
- A moderate stress level can only be applied if the 2 year drought scenario and the ten year drought scenario would trigger a circumstance.

The intent of this Rule is to assess the stress levels for a surface water drought scenario.. The "ten year drought scenario" based on a ten year period of lowest mean annual precipitation may not be reflective of a surface water drought scenario. The results obtained by running Scenarios G, H and I for the ten year "drought" period may be more reflective of an average annual condition and not a drought condition. If this is the case, the SPC may want to consider the alternative approach to the technical rules as described below. This would require Directors approval as per rule 15.1.

Recommendations

It is recommended that, when assessing a drought period at Tier 2, a moderate subwatershed stress level is only assigned when a two year drought scenario triggers a circumstance in rule 34(2)(e) as further analysis has indicated that the 10 year drought is, at times, not representative of drought conditions. This means that only Scenarios D, E and F need to be assessed, and Scenarios G, H and I are not required.

Tier 3 Local Area Risk Assessment – Surface Water Drought

Technical Rule 102(1)

- Rule 102(1) in relationship to a surface water system specifies the time period for scenarios B (existing system – ten year drought) and F (planned system – ten year drought) are evaluated to determine the exposure level of the local area.

Clarification of the Technical Rule Requirements for Tier 3 Local Area Risk Assessment

The Tier 3 Risk assessment is based on the analysis of modeling results for drought Scenarios B and F using a continuous ten year period for which precipitation records exist with the lowest mean annual precipitation.

The intent of this Rule is to assess the surface water risk level for a drought scenario. The “ten year drought scenario” simulation based on ten year period of lowest mean annual precipitation may not be reflective of a surface water drought scenario. In some cases, the ten year drought scenario simulation may be more reflective of an average annual condition and not a drought condition. If this is the case, the SPC may want to consider the alternative approach to the technical rules as described below. This would require Directors approval as per rule 15.1.

Recommendations

It is recommended that at Tier 3, in order to assess the risk to the Local Area, a two year drought period in addition to the 10 year period be used for Drought Scenarios B and F to assess the risk level to the Local Area.

The Local Area would be assigned an exposure level of high for Scenarios B or F when at any time with a continuous two year or 10 year drought the quantity of water that could have been taken from surface water bodies in the Local Area would not have been sufficient to meet the quantity of water or allocated quantity of water taken by those surface water intakes.

Rule 15.1 - Alternative Approach

If an SPC uses the recommended approaches to the Tier 2 and/or Tier 3 surface water drought Technical Rules to assign subwatershed stress or the risk level to a local area, the SPC should use Rule 15.1 to request Director approval. This would need to include an explanation of how the method or approach used to assign the stress and risk levels (i.e. the drought scenarios using the 2 year drought period) is “equivalent to or better than the approach or method prescribed in these rules” (i.e. the drought scenarios using the 10 year drought period). The requirements under Rule 15.1 are provided below.

Technical Rule 15.1

The Rule specifies that, despite any provision stated on any other rule, in preparing an assessment report a source protection committee may use an alternate method or approach for gathering information or for performing a task that departs from the method or approach prescribed in these rules if the following conditions are met:

- (1) The assessment report includes,
 - (a) a rationale for the departure; and
 - (b) an explanation of how the method or approach used by the source protection committee to gather information or perform the task is equivalent to or better than the approach or method prescribed in these rules
- (2) The Director has provided the source protection committee with written confirmation that he or she agrees to the departure and a copy of the confirmation is included in the assessment report.